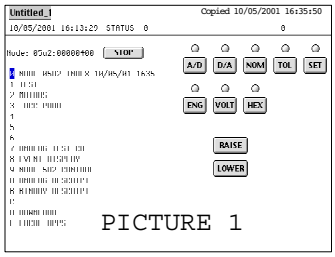
9-Cell Superconducting Capture Cavity Tuning Guidelines

J K Santucci, et. al. September 24, 2004

After cooling down the 9-Cell Superconducting Capture Cavity and the cryogenic read backs first indicate that is at operating temperature (1.8K), the entire cavity temperature is still not quite isothermobathic. I will take about one to four hours more (depending on how long the cavity was warm) for the entire cavity to equious reach operating temperature. When in this state, the volume of the cavity is not at its operating volume and it will reflect RF power back to the Klystron. When the 9-cell cavity is reflecting power back to the Klystron, difficulty occurs in raising the RF transmitted power signal to the desired 49mV. This phenomenon can reveal itself in a change in RF phase over the RF cycle (2100μs) of the 9-cell.

1. Ensure that you are authorized by H. Edwards to tune the 9-Cell cavity.
2. Bring the 9-Cell Supper conducting Capture Cavity RF transmitted power ("P_t 9-cell") signal to half gradient. (About 25mV).
3. Turn off the 9-Cell LLRF "feedback" (on the "*DOOCS" "DDD"* program).
4. Plug in the power cord for the "*9-Cell Cavity Tuning Stepping Motor Controller*" chassis. (Below the IRM in relay rack R01.)
5. Go to a *ParamPage* program and ensure that settings are enabled. (In the "Options" pull-down menu)
6. Select "VME Screen Image" in the "NEW" menu under the "File" pull-down menu.
7. Before doing anything else, type the IRM node number "5a2" then hit the "ENTER" key. (Not the RETURN key)
8. Interrupt on the "START" button in the "*VME Screen Image*" page.
9. Ensure that you are at the front index page. (See picture 1). If not, place your cursor on the spot where the inverse video "0" would be in the upper left (Column 1, Row 1), and then interrupt.

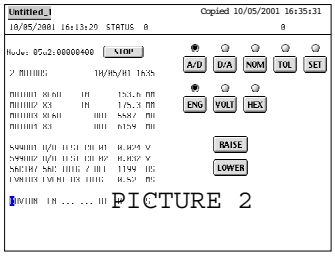


PICTURE 1

10. Select the "2" on page "2 MOTORS" by interrupting on it or using the arrow keys. Hit the "ENTER" key.

11. The parameter that we need it "CAVTUN" and is at the bottom of the page. (See picture 2).

12. Enable the stepping motor by selecting "DIS" and then toggling it (by hitting the ENTER key) to "EN".

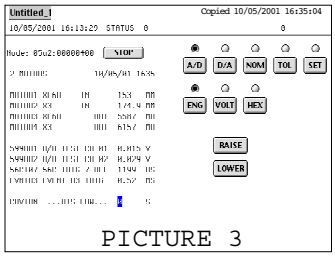


PICTURE 2

13. Set the drive current to hi by selecting "LOW" and then toggling it (by hitting the ENTER key) to "HI".

14. Select the number "0" on that same row to the right. Your page should now look like this. (See picture 3).

15. Type the number of steps that you wish the motor to move. Do not forget to type an "s" (case insensitive) at the end of the number. (i.e. "-100s").



PICTURE 3

NOTE: The sign convention for moving the 9-Cell Cavity Tuning Stepping Motor is as follows; If the phase of the 9-Cell RF increases throughout the RF cycle, then move a positive number of steps. If the phase of the 9-Cell RF decreases throughout the RF cycle, then move a negative number of steps.

16. Observe the change in the 9-Cell RF cavity phase plot on "*DDD*" after it updates (i.e. "*FERMI.RF/DSP/CAPTURE_CAVITY/VECTOR_SUM.PHASE*"). Extrapolate from your change how many additional steps to move the 9-Cell Cavity Tuning Stepping Motor. It is better to move in steps too few rather than too many.

NOTE: There is about a 10-step hysteresis in the stepping motor gearing.

17. You are done tuning when there is little change (about 20 deg.) in RF phase over the RF cycle (2100μs) of the 9-cell.

18. Undo steps 12 - 7, and 3.

NOTE: Do **NOT** forget to **unplug** the "*9-Cell Cavity Tuning Stepping Motor Contr*oller" chassis from step 3. The stepping motor is in the cryostat insolating vacuum, there for, leaving the chassis plugged in will put power to the stepping motor and burn it up.